FINAL ENVIRONMENTAL ASSESSMENT
GLENN CUNNINGHAM LAKE
AQUATIC HABITAT RESTORATION PROJECT
Douglas County, Nebraska

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Prepared For:
Nebraska Game and Parks Commission
2200 N. 33rd Street
Lincoln, NE 68503

Prepared By:
Olsson Associates
2120 South 72nd Street
Omaha, NE 68124

EXECUTIVE SUMMARY

The Nebraska Game and Parks Commission (NGPC), in cooperation with the City of Omaha, is planning an aquatic habitat restoration project at Glenn Cunningham Lake with the purpose of restoring and maintaining the recreational fishery in the lake by improving water quality, depth diversity, littoral (shoreline) and wetland quality, and developing a bass/panfish sport fishery. Glenn Cunningham Lake, constructed in the early 1970's, is a 377-acre multipurpose flood control and recreation reservoir located on the northern edge of the City of Omaha in Douglas County, Nebraska. The reservoir is supplied primarily by the Little Papillion Creek and four small tributaries to the Little Papillion Creek.

Currently, the United States Army Corps of Engineers (USACE) owns and operates the dam structure and surrounding land, and leases the site to the City of Omaha, which administers and maintains the reservoir's recreational facilities. In addition, Nebraska Game & Parks Commission manages the fishery. The City of Omaha has continued to develop the parkland and water recreation facilities surrounding Glenn Cunningham Lake, maintaining boat docks, restroom facilities, picnic grounds, trails and a campground. The primary uses of the reservoir and park include sightseeing, fishing, camping, non-motorized boating, windsurfing, and picnicking.

Over time the reservoir has begun to experience degradation due to excessive sediment and nutrient inflows from the watershed. The sediment and nutrient depositions have negatively impacted the water quality and lake fishery by reducing water storage, water depth, dissolved oxygen and habitat volume; and by contributing to a loss of aquatic vegetation and bottom structure. In addition, undesirable benthic feeding fish continue to churn the bed material and limit the growth of most aquatic and littoral vegetation species. Wetlands adjacent to and above the pool are generally of poor quality and are largely a monoculture of reed canarygrass.

Several objectives were identified In order to meet the project purpose. The objectives are listed below.

1. Remove accumulated sediment in the lake
2. Reduce shoreline erosion, reservoir sedimentation and nutrient loading

3. Improve manageability of pool elevations
4. Improve aquatic habitat
5. Improve fringe wetland diversity
6. Eradicate less desirable fish species and restock with sport fish

The implementation of the proposed project would serve to maintain the regions' public use of the reservoir as a recreational facility, maintain the reservoir's effectiveness as a flood and sediment control structure and improve the park's quality of aquatic and terrestrial wildlife resources.

Two alternatives, the no action alternative and the preferred alternative, have been considered for a lake restoration plan for the Glenn Cunningham Lake. Based on the results of the alternatives analysis and evaluation of the environmental effects of this proposed project, it has been concluded that the proposed project is not likely to cause significant impacts to human health or the environment.

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SECTION 1.0 PURPOSE AND NEED FOR THE PROJECT

1.1 Introduction

The Nebraska Game and Parks Commission (NGPC), in cooperation with the City of Omaha, is planning an aquatic habitat restoration project at Glenn Cunningham Lake (***Figure 1***) to improve water quality, reduce sedimentation and shoreline erosion, and enhance aquatic habitat. The proposed restoration measures include:

- removal of sediment from the lakebed
- modification of the outlet structure for improved lake level management
- construction of islands and shoals, and
- shoreline protection in the form of rock armored jetties and offshore breakwaters

The construction of these measures would necessitate a complete drawdown of the reservoir, maintained throughout the construction phase.

The goal of this environmental assessment is to comply with the requirements of the National Environmental Policy Act (NEPA) by comparing and evaluating the environmental impacts of measures that would meet specific ecosystem restoration objectives to improve the deteriorating aquatic habitat at Glenn Cunningham Lake.

1.2 Project Funding

Funding for the Glenn Cunningham Lake restoration project will be provided through the Nebraska Game and Parks Commission (NGPC) Aquatic Habitat Program, the Nebraska Department of Environmental Quality (NDEQ) administered Environmental Protection Agency (EPA) 319 Program, the Nebraska Environmental Trust and the City of Omaha. This project will involve aquatic habitat rehabilitation in the reservoir basin and will include stabilizing eroding shorelines, developing wetlands along segments of shoreline, excavating accumulated sediment in shallow areas and modifying the outlet structure to allow for water level management. Construction is expected to begin in 2006. The Natural Resources Conservation Service (NRCS) has identified Glenn Cunningham as a priority watershed for federal funds to

implement best management practices (BMPs). The Cunningham Watershed Coordination Council has been developing strategies for maintaining and/or improving water quality as the watershed becomes urbanized (NGPC, 2006).

1.3 Project Permitting

The proposed project will be undertaken pursuant to Section 404 of the Clean Water Act (33 U.S.C. 403). This project would qualify for a Nebraska General Permit (GP) 98-05 issued for lake rehabilitation projects. This permit authorizes dredging or excavating accumulated sediment in manmade lakes or ponds in Nebraska created through impoundment or excavation. The permit states that, “dredging or excavation is not to exceed elevations and contours at the time of pond/lake creation. Dredged/excavated material that is discharged into upland disposal sites will allow sufficient settling time before water returns to the lake or pond. Discharges into the lake or pond are allowed for the creation, enhancement, or restoration of fish or wildlife habitat, construction of sediment control facilities, shoreline stabilization, or fishing piers”. The project will also require a National Pollutant Discharge Elimination System (NPDES) permit for disturbance of greater than one acre of land. Other federal, state, and local permits applicable to the proposed project would be obtained.

1.4 Purpose of Project

The purpose of the Glenn Cunningham aquatic habitat restoration project is to implement a series of structural and nonstructural measures to restore and maintain the recreational fishery in the lake by improving water quality, depth diversity, littoral (shoreline) and wetland quality, and developing a bass/panfish sport fishery. The overall project objective is to restore a better ecosystem within the Glenn Cunningham Lake, which is currently threatened by numerous environmental components including sediment and nutrient deposition, loss of habitat diversity, degraded wetland quality, and a continually degrading fishery. In order to meet the project purpose, the project should achieve these objectives:

1. Remove accumulated sediment in the lake
2. Reduce shoreline erosion, reservoir sedimentation, and nutrient loading
3. Improve manageability of pool elevations
4. Improve aquatic habitat
5. Improve fringe wetland diversity
6. Eradicate less desirable fish species and restock with sport fish

The implementation of the proposed project would serve to maintain the regions' public use of the reservoir as a recreational facility, maintain the reservoir's effectiveness as a flood and sediment control structure, and improve the park's quality of aquatic and terrestrial wildlife resources.

1.5 Need of Project

The Glenn Cunningham Lake was built primarily for flood control, while providing additional benefits in the form of recreational opportunities, wildlife habitat and improved water quality. However, the reservoir was designed with no protection against environmental impacts of sediments and nutrients (e.g., nitrogen and phosphorus). As the lake has aged, it has begun to experience degradation due to excessive sediment and nutrient inflows from the watershed.

The sediment and nutrient depositions have negatively impacted the water quality and lake fishery by reducing lake volume, water depth, dissolved oxygen, and habitat diversity, and by contributing to a loss of aquatic vegetation and bottom structure. In addition, undesirable benthic feeding fish continue to churn the bed material and limit the growth of most aquatic and littoral vegetation species. Wetlands adjacent to and above the pool are generally of poor quality and are largely a monoculture of reed canarygrass, which is considered an invasive species.

Major contributors of sediment accumulation have been upstream erosion due to runoff events, and shoreline degradation. The sediment tends to shrink the usable volume of the lake by making it shallower (Montgomery, 1992). Previous area-capacity studies show that the lake had lost approximately 18.2 percent of its original volume between 1976 and 2003. Based on historic average annual sediment loads (1972 to 2003), the existing sediment loading to the reservoir was estimated and predicted to result in an average annual volume loss of 23-acre feet (Olsson, 2005). Sediment load has caused the existing lake bottom to become uniform in shape with very little depth diversity or other structure remaining. The sediment has reduced the depth of the multipurpose pool and has resulted in a delta forming upstream of Highway 36. The entire upper one third of the lake is now less than 10 feet deep, with half of the upper third less than 5 feet deep. Currently, the deepest region of the lake is a small area located near the dam that has waters just greater than 20 feet deep.

Much of the shoreline is subject to bank erosion caused by wind/wave action, and ice. This is especially true where the banks are steep and there is a relatively long wind fetch[1]. As a result, a large portion of the shorelines has been armored with riprap to prevent erosion. Most of the eastern shore of the lake has been rock armored; however, much of the riprap is in need of maintenance or repair. Riprap has also been supplemented along the face of the dam, placed on the banks near the boat ramp, on the shoreline near the Highway 36 bridge, and along a peninsula of land containing recreation facilities along the southwest shore of the lake.

The lake has also been affected by an excess nutrient load. Some of the nutrients such as nitrogen are water soluble; others such as phosphorus are likely to be adsorbed (attached) to sediment particles. Of the nutrients, phosphorus has had the greatest impact on the aquatic ecology, resulting in periodic overgrowths of algae, turbidity, and water quality problems.

[1] The distance across a body of water along which a wind blows to build waves before it hits land. The fetch affects the momentum of wave action from a constant direction. The greater the fetch, the greater the potential force of wave action on the shoreline.

SECTION 2.0 ALTERNATIVES

Two alternatives have been considered for a lake restoration plan for the Glenn Cunningham Lake:

- No Action alternative and,
- Preferred alternative

These two alternatives are discussed below.

2.1 Alternative 1: No Action

Under the No Action alternative, operation and maintenance activities would be expected to continue as in the past; however, no structural modifications or other proposed restoration measures would occur. Although it is likely that watershed conservation initiatives would somewhat reduce both the sediment yield and the nutrient inflow in the future, they would not reverse the problems that presently exist at the reservoir and sediment and nutrient inflows would continue to degrade the lake.

The continued accumulation of sediment in the conservation pool would cause the eventual loss of all deeper water habitat and underwater habitat structure related to lakebed topography. This in turn would adversely impact the ability of the lake to support a healthy fish population. As wetlands fill with sediment and nutrients, invasive reed canarygrass would become more dominant and the value of the wetland to fish and wildlife would continue to decline.

Shoreline erosion would continue to occur to some extent along all unprotected portions of the shoreline due to wind wave action, making the bottom sediments too unstable for rooted plants to become established and causing increased turbidity that would hinder plant growth. Physical battering by waves would cause damage to plants that do become established.

In addition, if the current fish community, currently dominated by carp and other benthic feeders, is allowed to persist in the lake, their feeding habits would also prevent the successful establishment of healthy littoral wetlands. Carp and to a lesser extent gizzard shad would continue to uproot the vegetation and stir up the bottom sediments creating turbidity that would adversely impact the plants that are not uprooted. This increased turbidity is expected to result in slower growth rates for fish that feed by sight, and some species of fish, such as bluegill and bass, will not spawn in excessively turbid water.

Under the no action alternative, fishing, boating and other water-based recreational opportunities would diminish. The loss of the lake would also have a negative aesthetic impact on many of the land-based recreational uses, including picnicking, camping and hiking as it would no longer provide for a lake-park environment.

Although this alternative does not meet the purpose and need for the proposed project it does provide an environmental baseline against which impacts of the proposed action (preferred alternative) can be compared.

2.2 Alternative 2: Preferred Alternative

The preferred alternative is the product of a year-long planning process led by the Nebraska Game and Parks Commission Fisheries Division. The plan components were developed and refined through an iterative process that included on-site evaluations to identify critical areas for protection and development of proposed project components that will improve water quality, create fishery habitat and be compatible with existing reservoir uses.

This alternative includes five main components:

(1) modification of the reservoir outlet works to facilitate water level management,

(2) sediment reshaping and removal, which will increase lake depth, create depth-diversity and increase the reservoir life-span,

(3) shoreline re-grading and construction of in-lake structures to restore and protect reservoir shoreline and create aquatic habitat,

(4) construction of small upstream water quality sediment traps, and

(5) fish population renovation and restocking with desirable fish species. Discussions of the five components follow. The components (with the exception of the fish assemblage/restocking) are illustrated on ***Figure 2***.

2.2.1 Outlet Works Modification

This component includes modification of the reservoir outlet works to facilitate reservoir water level management. The existing concrete riser will be modified to incorporate a downward opening slide gate (***Appendix A / Figure A-1)***. The gate will be operated by an actuator located on the top of the riser, allowing Corps personnel to draw down the reservoir water level or maintain it at any elevation between 1121.0 and 1117.0. This ability to periodically draw down and maintain the normal pool elevation facilitates the establishment and management of

emergent wetland vegetation around the perimeter of the lake by exposing the shallow areas of the lakebed early in the spring, which stimulates germination of existing wetland vegetation seed-stock. The reservoir will be returned to the normal pool elevation after germination, reducing the impact on other reservoir uses such as boating. The frequency and magnitude of water level management will be guided by a water level manipulation plan and in general, will occur on the order of once every five years. This management plan is discussed in further detail in Section 4.3.

2.2.2 Sediment Reshaping and Removal

This component of the preferred alternative includes removal and reshaping of the sediment that has accumulated in the normal pool of the main body of the reservoir south of Highway 36. Sediment removal is one of the primary components of this project because it will increase the effective life-span of the reservoir, create aquatic habitat diversity, and reduce wave-induced sediment re-suspension in reservoir embayments where deltas have formed at the mouths of the Little Papillion Creek and its tributaries.

Due to the significant technical considerations and expense associated with sediment removal, all of the accumulated sediment will not be removed. The preferred alternative includes using some of the sediment to create bottom diversity in the two major embayments on the west side of the reservoir. In the southernmost embayment, sediment deposits will be re-shaped to both deep and shallow shoals. These features will re-establish depth-diversity in the embayment, which is critical to establishment of a quality fishery. The shallow shoal at the upper end of the embayment is designed to facilitate establishment of emergent and submerged macrophyte communities. The deep shoal is designed at a depth sufficient to prevent interference with sail boating.

The sediment in the northernmost embayment on the west side of the reservoir will be re-shaped to create an island and two shallow shoals. These features will also re-establish depth diversity and facilitate establishment of wetland vegetation. The island will be vegetated with native grasses and protected from wave-induced erosion by rock riprap. A typical island cross-section is presented in ***Appendix A / Figure A-2***.

In areas where sediment reshaping capacity was insufficient or aesthetically unacceptable, the rehabilitation plan facilitates removal and disposal of up to 400,000 cubic yards (CY) of sediment. Varying amounts of sediment removal are planned in all of the reservoir embayments

but the majority will be removed from the north end of the reservoir and from the embayment adjacent to the campground and marina.

Sediment removed from the reservoir will be discharged on-site. Per Corps guidance, sediment spoils cannot reduce the flood-storage capacity of the reservoir. As such, the sediment must either be discharged above elevation 1147.0 or, if discharged below that elevation, flood-storage loss must be mitigated. Park area above elevation 1147.0 is limited and is typically steeply sloped, limiting the number of potential spoil sites.

The Corps approved an agreement that has allowed the use of upland soils from Corps property for fill on a nearby roadway project. The contractor is utilizing hillsides near Highway 36 and the park campground as borrow sites. Sediment from the reservoir will be discharged in these excavated areas as part of the rehabilitation project. This allows for deposition of over 100,000 CY of sediment below the flood pool elevation without the need to mitigate for loss of flood storage. The remaining sediment will be spoiled at several sites located above the flood pool elevation. These sites will be graded to blend with the existing topography as much as possible and will be re-vegetated with native grasses and trees. ***Figure 3*** shows the project spoil sites. The total amount of sediment removed from the reservoir is dependent on bid prices. As such, all of the spoil sites may not be utilized.

2.2.3 Shoreline Stabilization

This component includes construction of various in-lake erosion control and habitat enhancement features including underwater breakwaters, offshore breakwaters, perpendicular breakwaters, groin breakwaters and shoreline rehabilitation (***Appendix A / Figures A-2 thru A-4)***. These features will help to reduce bank erosion and instability and improve reservoir water quality by reducing locally generated turbidity and sediment re-suspension, and by allowing establishment of submergent and emergent vegetation. These measures will also create fish habitat and improve angler access to deep-water areas of the reservoir. The following paragraphs describe the major stabilization structures.

Underwater wavebreaks will be utilized at the north end of the reservoir, south of Highway 36. The design utilizes two offset east-west oriented breaks that will incorporate a compacted earthen core protected by rock riprap. The top of the wave breaks will be 0.5 feet below the normal pool elevation and will include rock piles with signage at intervals to prevent boating

accidents. The primary function of the wavebreaks is reduction of wave-induced erosion of the Highway 36 embankment.

Off-shore breakwaters would be constructed of a compacted earth embankment protected by rock riprap. The structures are oriented parallel to the shoreline at a depth of less than four (4) feet. The tops of the breakwaters will be planted with sandbar willows and the shoreward side will be vegetated. This plan includes off-shore breakwater protection of a significant portion of the west side of the reservoir, where wind-induced wave action has resulted in eroded cut-banks varying from two (2) to fifteen (15) feet in height. The breakwaters intercept waves before they reach the shoreline and also create an area of calm water between the structure and the shoreline, which is ideal area for wetland recruitment and game fish spawning and development.

Perpendicular and groin breakwaters are similar in design and functionality. They are earthen embankment-cored structures protected by rock riprap. They differ from the other breakwater structures in that they are oriented perpendicular to and connected to the shoreline. Both the perpendicular and groin breakwaters extend two (2) feet above the normal pool elevation and either extend into deeper water or have been designed with local excavation to create deep-water areas adjunct to the structures. These breakwaters block lateral wave action and sediment movement along the shoreline and provide deep-water angler access. Two of the groins are designed to be augmented with fishing piers that will provide handicap-accessible fishing access. The groin adjacent to the marina has been designed to facilitate the construction of a playground by the City of Omaha in the future.

2.2.4 Water Quality Sediment Traps

The plan includes construction of four small water quality sediment traps, one on each tributary that enters the reservoir below Highway 36. The sediment traps will be constructed of a small earthen embankment protected with rock riprap. Given the relatively large tributary drainage areas and expected frequent overtopping, each trap is similar in design to a low-water crossing with approximately 10,000 CY of excavation upstream of the structure to increase the trapping efficiency and sediment capacity.

2.2.5 Fish Assemblage and Restocking

The lake has been drained, which has removed less desirable fish species such as gizzard shad and carp (a non-native species) that have dominated the fish community for some time.

The lake will be restocked with desired species, such as walleye, bluegill, black crappie, channel catfish, and largemouth bass, with the goal of developing a bass/panfish sport fishery. Gizzard shad and carp are both omnivores (feeding on both animal and vegetable substances), and compete with juvenile sport fishes for plankton[2] food sources. Carp also tend to disturb lake-bottom sediment when rooting for food, causing increased water turbidity and uprooting vegetation. Removal of gizzard shad and carp will increase zooplankton, which in turn will consume greater amounts of algae, as well as provide increased food resources for juvenile game fish species. Removal of carp in particular would help in reducing turbidity.

2.3 Alternatives Comparison

The no action alternative would not provide any form of improvement to Glenn Cunningham Lake, and fails to fulfill the purpose and need of the proposed restoration project. Given its proximity to the City of Omaha, a negative socioeconomic effect of the reservoir's filling with sediment would be the loss of the types of water-based recreation afforded by the lake. Further, water and wetland quality would continue to degrade and the quality of fish and wildlife habitat would continue to decline.

Under the preferred alternative, implementation of each component would contribute to achieving the stated objectives (as listed in *Section 1.3*), including the overall objective of a balanced and diverse aquatic ecosystem. For example, lake water clarity would improve with a decrease in sediment and nutrient inflow, protection of shorelines from constant eroding, and the removal of benthic feeding fish that tend to stir up bottom sediments. Improved water clarity would then result in better habitat for a greater diversity of aquatic plant life, vertebrates and invertebrates. The greater diversity in the food chain would in turn provide a more sustainable habitat for more species of fish, including game fish. Constructing shoreline structures to reduce wave action would decrease the physical forces that result in bank sloughing, substrate and slope instability, suspension of shallow sediments, and turbidity. These structures, coupled with the ability to provide a controlled water level drawdown, would promote establishment of rooted aquatic vegetation in the littoral zone, which provides food and substrate for invertebrates, substrate for fish spawning, and structure and cover for both adult and juvenile fish. The preferred alternative meets the purpose and need as stated in *Section 1.0, Purpose and Need of the Project.*

[2] A diverse group of minute animals (zooplankton) and plants (phytoplankton) that freely drift in the water.

SECTION 3.0 AFFECTED ENVIRONMENT

3.1 Background

Glenn Cunningham Lake is located in Douglas County on the northern edge of the Omaha metropolitan area. The project site lies along 96th Street with entrances at State Highway 36, State Street, 96th Street, and Rainwood Road. The surface area of the reservoir is 377 acres and is approximately 1.8 miles long from north to south. The reservoir has approximately 6 miles of shoreline and when constructed, had a maximum depth of 31 feet. The reservoir is supplied primarily by the Little Papillion Creek, and four small tributaries to the Little Papillion Creek. Approximately 17 square miles of the Papillion Creek watershed drains into the reservoir. The earthen fill dam, which has a spillway elevation of 1,121 feet, is located in Section 22, Township 16 North, Range 12 East, Douglas County (refer to *Figure 1*).

Currently, the United States Army Corps of Engineers (USACE) owns and operates the structure and land, and leases the site to the City of Omaha, which administers and maintains the reservoir's recreational facilities. In addition, Nebraska Game & Parks Commission manages the fishery. The reservoir, including its surrounding parkland, is heavily utilized and as such, is an important ecological, recreational, and educational resource.

The City of Omaha has continued to develop the parkland and water recreation facilities surrounding Glenn Cunningham Lake, maintaining boat docks, restroom facilities, picnic grounds, trails and a campground to the park. The primary uses of the reservoir and park include camping, windsurfing, walking/jogging, fishing, picnicking, bicycling, and non-motorized boating. Power boating is permitted, but regulated at a 5 mph speed limit. Glenn Cunningham Lake has a double wide boat ramp, which can accommodate a variety of different kinds of boats including sailboats, power boats, canoes, and kayaks. The Corps' estimated 2003 park usage exceeded 999,900 visitor hours (Olssons, 2005).

Current conditions of the existing environment within the project area were assessed for this EA by means of field surveys, literature review, information obtained from coordination with the resource agencies, and review of maps and aerial photographs.

3.2 Climate

Douglas County has a typical continental climate with warm summers and cold dry winters, although temperatures and rainfall vary greatly from day to day and season to season. Winter temperatures average 25 degrees Fahrenheit (F), with average daily lows around 15 degrees F. The lowest recorded winter temperature was -32 degrees in January of 1882. Summer temperatures average 74 degrees F, with average daily highs around 85 degrees F. The highest recorded summer temperature was 105 degrees F in 1938. Humidity in the summer months ranges from 60% to 80%. Most precipitation occurs from April through September in the form of showers or thunderstorms in the evening hours. Average annual rainfall is about 30 inches with snowfall averaging about 28 inches (NRCS, 2006).

3.3 Topography and Soils

3.3.1 Topography

The Papillion Creek drainage basin lies within the Dissected Till Plains section of the Central Lowland physiographic province. Surface geology of the basin, with the exception of recent alluvium in the valleys, is Pleistocene in age and is entirely of eolian (wind-blown) origin (USACE 1974). The major topographic feature of the area is the relatively narrow flat floodplain surrounded by steeply sloping and rolling hills. There is a well-developed, dendritic drainage network of rivers and streams that meander across relatively broad valleys. The ephemeral streams that contribute to the lake can be characterized by deeply cut, eroded and gullied upper reaches, and a shallow wide streambed. Little Papillion Creek and its tributaries flow mainly south to southeast toward the Missouri River. The total reservoir drainage area is approximately 11,400 acres (Olsson, 2005).

Within Douglas County, the areas of strongest relief are in the bluff areas along the Missouri River where slopes are steep to very steep. The maximum relief is around 240 feet in the bluffs in the northern part of Omaha. Level upland divides are few and those that are present are very small. The highest elevation in Douglas County is 1,300 feet on the divide north of Elk City in Douglas County. The lowest elevation is 950 feet at the junction of the Platte and Missouri Rivers in the extreme southeastern corner of the county (SCS, 1975).

The original topography of the project site itself was altered with the construction of the earthfill dam, impoundment of a lake, development of recreational facilities, and plantings and cultivation of plant life suited to recreation and wildlife habitat. The development of this area changed the

land use from essentially agricultural uses to the multiple purposes of flood control, water oriented and general recreation, and the preservation and enhancement of habitat for flora and fauna.

3.3.2 Soils

Soils in the project area are primarily of the Monona-Ida and Judson associations, and to a lesser extent, Colo and Kennebec soils, Gibbon Silt Clay Loam and Pohocco soils. The Monona-Ida series consist of very deep silty soils on bluffs adjacent to the Missouri River Valley that formed in silty loess deposited by wind. Monona soils are in the bluff area and are deep, nearly level to very step and well drained. Ida soils are on narrow ridgetops and on sides of ridges bordering intermittent drainageways. They are deep strongly sloping to very deep, calcareous, and well drained. Judson soils consist of deep well-drained soils on colluvial foot slopes in upland drainageways, at the base of slopes, and above the bottom lands. The surface layer and subsoil is silt loam. The underlying material is silty clay loam. The overall runoff potential from these soils is moderate and they are highly susceptible to gully and rill erosion. For some these soils, such as the Ida series, erosion has removed much of the original surface layer (SCS 1975).

Colo and Kennebec soils are described by the NRCS as a hydric soil with deep, nearly level soils formed in alluvium on bottomland. Colo soil is poorly drained and Kennebec soil is well drained. These soils are silty clay loam in the upper part and sandy loam in the lower part. Gibbon Silty Clay Loam is a deep, nearly level, calcareous, somewhat poorly drained soil formed in alluvial on bottom land. It has a silty clay loam surface layer and moderately permeable silt loam underlying material. This soil is occasionally flooded. Pohocco soils are deep, well-drained soils formed in loess on uplands. They have a silty loam surface layer and moderately permeable silt loam subsoil. Erosion has removed part of the original surface layer.

Currently, the watershed is experiencing rapid urbanization. With the change from agricultural to urban land use, soils in the watershed are disturbed, contributing to flushes of sediment during construction periods. Sediments entering the reservoir have filled deep areas more quickly than shallows in the upstream portion of the lake, leveling the lakebed topography and creating shallow depositional deltas.

3.4 Reservoir Multipurpose Zone

Glenn Cunningham Lake was built as a flood control reservoir, and has served to intercept flood waters originating in the upper Papillion Creek watershed. In doing so, it has trapped significant volumes of sediment, borne along with the floodwater. The depositing of this sediment into the lake has caused loss of useable lake area for recreation, and a loss in habitat structure for desirable fish species. Table 1 shows the lake zones for the reservoir. Additional information regarding the flood hydrology and reservoir routings to establish flood elevations can be found in the Corps Master Plan.

Table 1
Glenn Cunningham Lake Zones

Zone	Lowest elevation Feet msl	Highest elevation Feet msl	Storage capacity acre-feet	Surface area acres
Surcharge	1142	1147	5,404	1,170
Flood control	1121	1142	14,016	991
Multipurpose (conservation) pool	1085	1121	3,705	377

In 1976, the Corps reported the reservoir's multipurpose pool (also referred to as conservation pool) volume as being 3,705 acre-feet (ac-ft), and in 2003 it was surveyed by NDEQ as being 3,030 ac-ft. The total loss for this period was 675 ac-ft, which is an average annual loss of 25.0ac-ft/yr or 0.67% loss of the reservoirs original volume per year. Based on these studies, the lake has lost approximately 18.2% of its original volume since 1976 (Olsson 2005).

The continued accumulation of sediment in the multipurpose pool will cause the eventual loss of all deeper water habitat and underwater structure related to lakebed topography. This loss of lake depth diversity and bottom structure will adversely impact the ability of the lake to support a healthy fish population. Depth diversity and bottom structure provide hiding places, feeding areas, and a variety of microhabitats that are essential for a healthy fish community. Depth diversity in the littoral zone also helps to maintain a more diverse wetland plant community. To provide a projection of loss of water depths, the 1974 Master Plan projected that 16 percent of the original conservation pool area would probably have depths of at least 5 feet after 50 years and that 1 percent would probably have depths of at least 10 feet, but that none of the conservation pool would have depths of 15 feet or greater (USACE 1974).

The highest elevation for the multipurpose zone and the lowest elevation for the flood control zone is 1121 mean sea level (msl). Therefore, the flood control pool would also be impacted to a degree as the multipurpose pool fills in, with some loss of flood storage most likely occurring in the upper end of the reservoir. Sediments entering the basin have filled deep areas more quickly than shallows in the upstream portion of the lake, leveling the lakebed topography and creating shallow depositional deltas. The main tributary entering the lake is the Little Papillion Creek. There is currently no sediment control structure on this creek. As the water in the creek slows down when it enters the lake, much of the heavier sediment drops out. This has caused the creek bed and its adjacent floodplain to fill with sediment, and a delta to form at the upstream end of the lake.

3.5 Water Quality

The Nebraska Surface Water Quality Standards (Title 117) assigns “beneficial use” to all surface waters within or bordering the State of Nebraska. Beneficial use is defined as the productive use of surface waters for which water quality is protected, and include but are not limited to agricultural, industrial, and public water supplies; support and propagation of fish, and other aquatic life; recreation in and on the water; and aesthetics. The beneficial uses for Glenn Cunningham Lake defined by Title 117 are: 1) primary contact recreation; 2) aquatic life, 3) water supply - agriculture, and 4) aesthetics.

In 2004, the Glenn Cunningham Lake was placed within Category 5[3] of the Section 303(d) List of Impaired Waterbodies due to the presence of in-lake sediment (NDEQ, 2004). While sediment continues to impair the water quality of this reservoir, affecting its beneficial uses, recent data assessments also indicate that selenium, phosphorus and nitrogen concentrations are additional causes of impaired water quality. Glenn Cunningham Lake continues to be a Category 5 listing on the 2005 Section 303(d) list (NDEQ, 2006).

Upstream erosion, caused by the watershed's agricultural activities and increasing residential development, destabilizes the watershed’s soils, which wash off the hillsides in runoff resulting in the inflow and deposition of excessive sediment and nutrients. Because watershed soils are fine textured, the majority of sediment reaching the lake requires a long time to settle out, increasing water turbidity; fine sediments take days to settle out and are easily re-suspended.

[3] Category 5 classifies waterbodies where one or more beneficial uses are determined to be impaired by one or more pollutants and all of the total maximum daily loads (TMDLs) have not been developed.

Water transparency within the lake is generally poor, primarily due to suspended sediment (Olsson 2005).

The shoreline areas at Glenn Cunningham Lake are relatively high-energy areas that are constantly battered by windblown waves, causing bank erosion along the lake shore that also contributes to sediment deposition. A significant portion of the western shore consists of steep banks that rise 2 to 4 feet above the normal lake level. These areas constantly erode, especially on windy days. This causes the lake water in a 15 to 20 foot band adjacent to the shore to be very turbid due to the sediment input from the eroding shorelines and the re-suspension of bottom sediments caused by turbulence from the waves.

A little more than a third of the way south from Highway 36 on the lake's western shore, there is a prominent point that protrudes out into the lake. This point is approximately 15 feet high with very steep, unprotected, eroded banks. During windy days when the wind is blowing predominantly from the south, a large brown plume of sediment can be seen coming from this point and extending hundreds of feet into the reservoir. This site is undoubtedly contributing greatly to the overall turbidity and water quality of the reservoir.

3.6 Air Quality

Ambient monitoring conducted in 2003-2004 indicated that Omaha's air quality is well within the limits established by the National Ambient Air Quality Standards (NAAQS). There have been no violations of the NAAQS in Douglas County; and according to the Nebraska Department Environmental Quality, the project area is in attainment of these standards (NDEQ, 2005).

3.7 Noise

Sources of noise in and around the project site are primarily the result of traffic on U.S. Highway 36. Seasonal activities, including recreational boating and agricultural activities are also sources of noise. Background noise levels are generally low in the project area. Future development may increase noise levels to an unknown degree.

3.8 Socioeconomics

3.8.1 Recreation

The City of Omaha has recreational facilities, restrooms, and buildings around the reservoir, including one functioning boat ramp that can accommodate a variety of different kinds of boats

including sailboats, powerboats, canoes, and kayaks. Wind surfing is increasingly popular on the lake. Power boating is permitted but is limited to a 5 mph regulation. In the past, a private concessionaire rented small paddleboats, sailboats and canoes, provided boating instruction, sold bait and refreshments. Other types of recreational use at Glenn Cunningham Lake include sightseeing, fishing, picnicking, and camping.

3.8.2 Land Use

The U.S. Army Corps of Engineers (Corps) owns more than 1,050 acres of parkland that surround the lake, including 450 acres, north of state Highway 36, designated as wildlife area (USACE, 2006). These project lands consist of the reservoir and surrounding uplands, which have been given the following land use designations: Recreation-Intensive Use, Recreation-Low Density, Project Operations, and Wildlife Management.

The areas designated as Recreation-Intensive Use are located between Highway 36 and State Street along the shoreline. The primary activities in this area include picnicking, shoreline fishing, boating (including boat launching), and camping. The areas designated as Recreation-Low Density are located between State Street and Highway 36 along the shoreline and below the dam, and include the open spaces between intensively developed recreation areas, hiking trails, and walk-in camping. Project Operations land includes all land necessary for the safe and efficient operation of the project for purposes other than for recreation or fish and wildlife (i.e. flood control). Wildlife Management lands were acquired for and included within project operations and allocated as habitat for fish and wildlife species. These lands are located north of Highway 36 and extend to the county line between Washington and Douglas counties. They are generally idle lands covered by riparian vegetation, wetlands, and upland areas. Trees, grasses, and other flora cover the upland areas. A system of trails and an archery range are located on Corps land south of Dutch Hall Road.

3.8.3 Prime Farmland

Prime farmland, as defined by the USDA, is the land that is best suited to food, feed, forage, fiber, and oilseed crops and is also available for these uses. It may be cropland, pasture, woodland, or other land, but is not urban and built-up land or water areas (NRCS 2006). Prime farmland soils are located in the project vicinity but are limited to areas where there are flowage easements. There are no existing agricultural activities taking place within the project boundary.

3.9 Cultural Resources

An archeological survey and assessment was conducted of the Glenn Cunningham Lake recreation area in June 2006 and a report was submitted to the Nebraska State Historic Preservation Office (SHPO) in accordance with Section 106 of the National Historic Preservation Act. The survey and assessment determined that there were no significant historic archeological sites or previously unrecorded prehistoric resources within the Area of Potential Effect (APE) (UNL 2006). Therefore, no cultural resources would be impacted by the implementation of this project or by the no action alternative.

3.10 Vegetation

Prior to construction of the dam and reservoir, the project lands had been transformed from a natural landscape to land used for dryland cultivation and to a lesser extent, pastureland. Native plant communities were either greatly disturbed or destroyed (USACE 1974). The construction of the dam and inundation to form the reservoir eliminated much of the existing woody vegetation established along the creek, and replaced the dryland vegetation communities (within the pool boundary) with aquatic ones. The majority of the project lands were then replanted with various woody and herbaceous species for aesthetic, recreational, wildlife, and soil stabilization purposes (USACE 1976).

On the higher ground above the valley floor, a variety of trees, shrubs, and grasses were planted to replace wildlife habitat that was impacted when the creek and its associated lowlands were flooded to form the reservoir. Vegetation types and species planted were chosen based on their ability to tolerate inundation, and their ability to provide food (fruit and berries), shelter, escape cover, nesting areas and breeding habitat for birds and other wildlife. Tree and shrub species planted included dogwood, silver maple, cottonwood, willow, sycamore, hackberry, honey locust, honeysuckle, and buffaloberry. Native grass species planted included big bluestem, little bluestem, Indian grass, switchgrass, sideoats grama, and western wheatgrass. Non-native smooth brome grass also became abundant within the native grass plantings.

3.11 Wetlands

Within the shallow water along the shore (littoral zone), aquatic emergent (partly above water), aquatic submergent (underwater), and other littoral vegetation species are limited, and the shoreline supports little or no woody vegetation. A few contributing factors include, (1) the

destructive action of benthic feeding fish that continue to churn the bed material causing high turbidity and uprooting vegetation, (2) pounding wave action against the shoreline causing the bottom sediments to be unstable and the water near the shore to be turbid preventing adequate light infiltration, and (3) a fairly constant water level that prevents the soils in the shallow water littoral zone from ever drying and being exposed to sunlight and oxygen.

Currently, wetland vegetation along the shoreline is limited at Glenn Cunningham Lake. Small patches of cattails and river bulrush can be found growing among the riprap along the shoreline in a few isolated areas along the main body of the lake. The invasive reed canarygrass, along with native arrowhead and cattails, can be found in the mouth of the southeast tributary to the lake, including a short distance upstream. Reed canarygrass mixed with small patches of cattails and river bulrush grows relatively thickly where sediment has deposited at the mouths of three of the other small tributaries that enter the lake south of Highway 36. Very little, if any of this vegetation grows within the pool of the lake. Instead, it grows at or above the water surface on recently deposited sediment. A delta that formed where the creek enters the upstream (north) end of the reservoir has developed into an emergent wetland that is dominated by reed canarygrass. Arrowhead is often scattered in the deeper water adjacent to the reed canarygrass.

A wetland evaluation was conducted at Glenn Cunningham Lake on June 13 and 19, 2006. During the site visit, normal conditions were not present due to the draining of Glenn Cunningham Lake. The investigation was performed assuming the normal pool elevation would be restored, based on maps showing normal pool elevation. Based on the review of existing resources and the field investigation, it was determined that there are three Palustrine Emergent Seasonally Flooded (PEMC) wetlands, one Palustrine Emergent Semipermanently Flooded (PEMF) wetland, five PEMC/PEMF wetlands and several small Lacustrine Emergent Semipermanently Flooded (LEMF) wetlands along the fringe of the lake. Two perennial and four intermittent streams were also identified. The total area of wetlands is 6.79 acres and the total length of perennial and intermittent streams is 9,210 feet. The complete wetland delineation is attached as ***Appendix B***.

3.12 Wildlife

The predominant species of upland wildlife surrounding the project area include ringneck pheasant, fox squirrel, bobwhite quail, whitetail deer, cottontail rabbit, and mourning dove.

Other common inhabitants include coyote, red fox, raccoon, opossum, muskrat, mink, gopher, skunk and a great variety of songbirds (USACE, June 1976). Areas designated as Wildlife Management provide habitat for migratory and local wildlife species in a region where intensive farming has eliminated most available habitat. These lands were established to mitigate for the loss of upland and riparian woodland habitat resulting from the construction of the Glenn Cunningham Lake.

Terrestrial cover types which occur in the project area include woodlands and grassland habitat. These habitats are conducive for migrating shorebirds and waterfowl, as well as hawks, pheasants, beavers, cottontail rabbit, fox squirrel and deer that reside permanently or temporarily at the reservoir. In addition, wetland vegetation occurring along the shoreline fringe provides food, water or shelter for beaver, frogs, deer and raccoon, and is essential habitat for many types of ducks, geese, herons, shorebirds, turtles, snakes and other animals that live around or frequent the reservoir.

A number of different migratory waterfowl and shore birds stop over at Glenn Cunningham Lake during their annual migrations. Corps personnel have identified mallard, blue-winged teal, Canada goose, double-crested cormorant, pied-billed grebe, and great blue heron in the main body of the lake.

3.13 Fish

Principle species managed at Glenn Cunningham Lake are recreational sport fish such as walleye, bluegill, black crappie, channel catfish, and largemouth bass. Due to the reservoir's sedimentation problem and eroding shorelines, conditions do not favor habitat in which these fish species could be successful. The results of large flood inflows and long periods of static water levels are limiting factors to certain types of habitat. The sediment and phosphorus loads negatively impact the lake fishery and other components of the aquatic ecosystem by reducing water clarity, water depth, depth diversity, and volume, and by contributing to a loss of macrophytic aquatic vegetation, an increase in algal blooms, and a loss of bottom structure.

The lake contains large numbers of carp, a non-native species, and an imbalance of native species, such as gizzard shad, yellow bass, and drum that are common enough to have harmful effects on the reservoir ecosystem. These fish consume zooplankton, which all fishes typically feed on in their larval stages, increasing competition for limited food resources. Bottom feeders

tend to disturb or dislodge aquatic vegetation and prevent disturbed plants from re-establishing leading to the permanent removal of water plants from many habitats. Carp are known to stir up lake-bottom sediments, increasing turbidity which clouds the water and reduces penetration by sunlight, again affecting aquatic plant growth and adding to water nutrient levels. Turbid water makes it difficult for sight feeding fish such as walleye, bluegill, and largemouth bass to see their food, as well as an angler's bait.

3.14 Threatened and Endangered Species

In accordance with Section 7 of the Endangered Species Act of 1973, as amended, a request was made to the Nebraska field office of the U.S. Fish and Wildlife Service (USFWS) in Grand Island, Nebraska to identify federally listed threatened or endangered species that may occur within the project area. In a letter dated March 20, 2006, the USFWS provided a list of threatened and endangered species in the project vicinity. The species on this list are shown in Table 2 below. A description of the federally listed threatened, endangered, and candidate species identified by the USFWS follows.

Table 2
Threatened and Endangered Species that may Occur in the Glenn Cunningham Lake Project Area

Common Name	Scientific Name	Classification	Year Listed
Bald Eagle	Haliaeetus leucocephalus	Threatened	1978
Western Prairie Fringed Orchid	Platanthera praeclara	Threatened	1989

Bald Eagle

The Bald Eagle may occur as a migrant and/or winter resident in the proposed project area. Bald Eagles prefer forested habitats near streams, reservoirs, and wetlands. Eagles concentrate near open water, such as below the tailraces of dams during the winter. Preferred roosting areas are those that provide shelter from the wind, and are near a body of water. Cottonwood trees are strongly preferred over other species. Dead trees are strongly preferred as daytime perches, with the tallest trees being utilized most often. Bald Eagles feed primarily on crippled waterfowl and fish, but will take upland game birds, other birds, rodents, and feed on carrion.

Bald Eagles may be attracted to Glenn Cunningham Lake by concentrations of waterfowl during the spring and fall migration periods. Potential foraging, perching, and roosting habitat for Bald Eagles currently exists at Glenn Cunningham Lake, however, no documented perch or roost sites have been identified. Although no perch or roost sites have been identified, Bald Eagles do undoubtedly perch in trees within the project area during their annual migration, and roost sites could be established in the future.

Western Prairie Fringed Orchid

The western prairie fringed orchid is a species of the North American tallgrass prairie community. Western prairie fringed orchid populations have declined significantly throughout their range due to conversion of most of their habitats to cropland, overgrazing, intensive hay mowing, and drainage. Potential habitat typical of the project's ecoregion includes high quality, unbroken prairie with transition zones between sedge meadows and tall grass prairie. No potential orchid habitat of this type is known to occur in the proposed project area.

SECTION 4.0 ENVIRONMENTAL IMPACT

This section describes the probable environmental consequences associated with implementing the proposed project.

4.1 Climate

No change in climatic conditions is expected due to activities related to this project.

4.2 Topography and Soils

4.2.1 Topography

The project would require removal of accumulated sediment that would be discharged on-site within the Glenn Cunningham Lake park boundary, or used in nearby construction projects. As discussed in *Section 2.2.2*., a contractor has been allowed to use upland soils from Corps property for fill on a nearby roadway project. The contractor is utilizing hillsides near Highway 36 and the park campground as borrow sites (refer to *Figure 3*). The majority of sediment from the reservoir will be discharged in these excavated areas as part of the rehabilitation project. Any remaining sediment will be discharged in upland sites, although the number of potential spoil sites would be limited as the upland area of the park is typically steeply sloped,. The spoil site would then be graded to blend with the existing topography as much as possible and re-vegetated with native grasses and trees. It is noted that sediment removed is dependent on bid price, and as such, all of the spoil sites may not be utilized. In complying with Corps guidance, it is not anticipated that the flood storage capacity of the reservoir would be reduced; however, in the event spoil would need to be placed below elevation 1147.0, flood storage loss would be mitigated.

The no action alternative would not require the removal of sediment and therefore would not result in changes in the existing topography of the reservoir or the surrounding park area.

4.2.2 Soils

The majority of soils within the project area consist of silt loam and some contain a silty clay loam underlayer. Silt loam consists primarily of silt (smaller than sand, but larger than clay), with a smaller portion of clay. Silty clay loam consists of soil materials that contain primarily clay, with a lesser amount of sand. Silty clay soils posses an inherent cohesiveness, due to the clay particles acting as a binders, which permits the development of vertical banks along

drainage courses. Saturation reduces this cohesiveness and makes the soil more susceptible to erosion.

Currently, soils within the watershed become dislodged as housing construction and agricultural activities occur. These soils are then carried in runoff from the upstream watershed to the bottomlands, stream and reservoir below and are deposited as sediment. Sedimentation removed from the lakebed and associated shorelines would be placed in previously excavated areas, or in upland areas within the park boundary. The sediment would be stabilized, graded to the extent possible to level it with existing topography, and capped with topsoil from upland disposal areas. Native grasses, trees and shrubs would then be planted which would help reduce surface runoff and stabilize the soil, and would also serve to enhance habitat for flora and fauna.

Previous testing was conducted by NDEQ between 1989-1991 for lake and reservoir sediment quality at Glenn Cunningham Lake. Results showed that contaminants tested were below detection limits (Table 3). Based on these test results, it is not anticipated that there would be potential for contaminant-related impacts associated with the discharge of dredged material into upland areas. In addition, sufficient settling time for discharged dredged/excavated material will be allowed before water returns to the lake or pond.

TABLE 3. NDEQ Lake and Reservoir Sediment Quality Data (1989-1991) for Glenn Cunningham Lake

Contaminant	Concentration	Remark
Aldrin	0	Below Detection Limit
Dieldrin	0	Below Detection Limit
Chlordane	0	Below Detection Limit
4,4 DDE	0	Below Detection Limit
4,4 DDD	0	Below Detection Limit
Endrin	0	Below Detection Limit
Heptachlor	0	Below Detection Limit
Heptachlor Epoxide	0	Below Detection Limit
Gamma BHC	0	Below Detection Limit
PCB - 1242	0	Below Detection Limit
PCB - 1254	0	Below Detection Limit
PCB - 1221	0	Below Detection Limit
PCB - 1232	0	Below Detection Limit
PCB - 1248	0	Below Detection Limit
PCB - 1260	0	Below Detection Limit
PCB - 1016	0	Below Detection Limit
Toxaphene	0	Below Detection Limit
DDT	0	Below Detection Limit

The no action alternative would not have an impact on soils within the project area. The lake would continue to accumulate sediment from runoff.

4.3 Reservoir Multipurpose Zone

One of the primary components of this project is the removal of the accumulated sediment from the bottom of the lakebed. Sediment removed from the reservoir will be spoiled on-site. Per Corps guidance, sediment spoils cannot reduce the flood-storage capacity of the reservoir. As such, the sediment must either be spoiled above elevation 1147.0 or, if spoiled below that elevation, flood-storage loss must be mitigated. Some material would be placed below this elevation in areas where contractor(s) have borrowed fill for other projects (refer to *Section 2.2.2*). It is not anticipated that the removal of sediment will have an impact on the reservoir's flood-storage capacity.

The ability to provide a controlled water level drawdown is a valuable management tool for providing aquatic benefits. The Nebraska Game and Parks Commission (NGPC) would like to periodically draw down Glenn Cunningham Lake to allow periodic vegetation planting for aquatic habitat improvement, to allow for sediment removal, and to permit construction of depth diversity features which would improve or maintain fish habitat. The current outlet structure on the dam at the reservoir was not designed to allow for minor and frequent drawdowns.

Minimum water levels at Glenn Cunningham Lake are fairly constant (fluctuations are generally measured in inches) and rarely drop below the designated elevation of the multipurpose pool, which is 1,121 feet above mean sea level (msl). Outlet modifications could help better manage the lake's water levels for shoreline habitat management. Littoral wetlands can be improved by planting and nurturing selected species of plants using managed water levels. Drawing down the lake exposes a portion of the lake bottom to air, which solidifies and aerates the soil. This creates conditions conducive to vegetation growth either by volunteer vegetation, or by seeding. This vegetation is very important because it provides food and substrate for invertebrates, substrate for fish spawning, and structure and cover for both adult and juvenile fish. Once the vegetation is established, the lake is then slowly raised back to the normal pool elevation flooding the newly established vegetation.

The NGPC will provide a tentative 5-year adaptive management plan, outlining the frequency, duration and levels of anticipated lake drawdowns that would be needed for the maintenance of

lake fishery (i.e., wetland management, depth diversity structures, sediment removal). The management plan should also include details on the following items: 1) the agency that will physically execute the water level changes, including notification to the Corps when adjustments are made, 2) the agency responsible for cleaning of the sediment traps and appropriate disposal of the material, 3) a vegetation review to ensure that desired littoral wetland species become established, with a course of action to be taken if undesired species (i.e., reed canary grass) become invasive, and 4) approval of the management plan. If necessitated, a public meeting would be held so concerned stakeholders and/or other interested parties have an opportunity to comment and offer input on the management plan.

The no action alternative would result in no change in the permanent pool elevation. Eventually however, the lake would fill in with sediment except for a stream extending from the headwaters of the lake to the current outlet structure, creating a dry flood storage structure. Flood storage would remain the same but the reservoir would no longer be useful as a recreation or aquatic habitat resource.

4.4 Water Quality

Temporary increases in sediment load and erosion may occur during the construction of the project; however, Best Management Practices (BMP's) would be implemented to control erosion and minimize these impacts. Long-term water quality would improve due to better sediment and erosion control as a direct result of this project. Reducing bank erosion would provide indirect benefits to the objective of littoral zone improvement and to reservoir water quality, by reducing locally generated turbidity and sediment resuspension.

In addition, measures by the city could be proposed to designate "no mowing zones" along the western shoreline and other segments around the lakeshore, allowing shoreline vegetation to have a greater stabilizing effect and the opportunity for volunteer trees to become established.

The watershed's agricultural activities, and especially the new housing areas being developed in the watershed increase upstream erosion adding to the sediment load, causing an ongoing impact on downstream resources including the stream, bottomlands, and the reservoir. The degree to which developers and contractors use BMP's for sediment control during construction of urban dwellings is an important factor. Development proposals within the City of Omaha's zoning jurisdiction and reviewed by the Subdivision Review Committee, should ensure that

adequate measures to control wind and water erosion are incorporated in the construction plans.

The no action alternative would result in the continued degradation of water quality within the reservoir and the downstream portion of the Little Papillion Creek.

4.5 Air Quality

Short-term localized impacts that may occur would consist predominantly of exhaust from construction equipment and dust from the site. Measures such as watering bare soil would be taken to minimize dust during the implementation phase of the project, and there would be no long-term impacts.

The no action alternative would have no impact on air quality.

4.6 Noise

Short-term noise levels would be increased due to construction activities on the site. Noise impacts will be mitigated by restricting these activities to daylight hours. There are no sensitive receptors in the vicinity of the site and no long-term noise impacts are expected. Background noise levels would increase with either the build or no-action alternatives due to urban development.

The no action alternative would have no short-term impact on noise.

4.7 Socioeconomics

4.7.1 Recreation

Recreation facilities, managed by the City of Omaha, are in need of upgrading and maintenance, which includes replacing most of the trails and roads around the lake. The City has contracted a consultant to develop a comprehensive recreation plan and intends to seek federal funding once the plan is developed. There is City interest in completing the recreational trail around the north end of the reservoir, with a preliminary alignment placing the northern segment of the trail along Highway 36.

Construction for this project would include drawing down the lake level for approximately 6 months before construction and during a 12-month construction period. Although the drawdown

would temporarily affect Glenn Cunningham Lake by limiting water dependent recreational activities until the reservoir refills, the loss of this recreational opportunity would have a minimal short-term impact on the economy of the area. Other reservoirs within the Papillion Creek watershed could substitute for water-related activities during the temporary drawdown and include Standing Bear Lake (east), Zorinsky Lake (southeast), and Wehrspann Lake (southwest).

In addition, the private concessionaire has not renewed the lease to continue providing recreational equipment at the reservoir; however, this operation could continue if a new owner is found.

The surrounding park would continue to provide opportunities for camping and leisure activities. Playgrounds, paths, trails, picnic area, shelters, restroom and open space would not be affected by the drawdown (with the exception of a temporary aesthetic impact) and would remain open.

The no action alternative would likely have a small negative impact on the local economy because the overall quality and aesthetics of the reservoir would permanently decline making nearby property less desirable.

4.7.2 Land Use

The Papillion Creek watershed is experiencing fairly rapid urbanization. Conversion of cropland to acreages continues to alter land use in the upper watershed. Currently, the City of Omaha is growing rapidly with urban development already infringing on the extreme southeast edge of the reservoir. City of Omaha planners expect this trend to continue, and they project complete build out of the Papillion Creek watershed before 2050 (Olson Associates, 2003). The proposed project would not impact urban development that is already occurring and will continue to occur within the watershed. The proposed project is not located in an area that would have a disproportionate impact on minorities, or socio-economically, disadvantaged populations. The areas currently designated as Recreation-Intensive Use, Recreation-Low Density, Project Operations, and Wildlife Management would remain unchanged.

The no action alternative would not impact current land use.

4.7.3 Prime Farmland

The proposed project would not have an impact on any farms or agricultural land within the project boundary.

4.8 Cultural Resources

In a letter dated April 5, 2006, the Nebraska State Historical Society (SHPO) concurred with the determination that no architectural or archeological cultural resources exist on the project area. It was recommended that construction workers involved in the project be aware that buried artifacts may be encountered. In the event that cultural resources are encountered during construction activities, construction would be stopped and the Corps' Missouri River Project Office would be contacted. Construction would not be resumed until approval has been received from the Nebraska SHPO.

4.9 Vegetation

The proposed project places an emphasis on improving quantity and variety of native plant species wherever possible. Native trees, shrubs, and herbaceous species will be planted to replace upland and riparian habitat disturbed during the process of renovating the lake, which would include any sites used as spoil areas for dredged material. Consideration in selection of plant species will be based on their value to wildlife as food, shelter, breeding habitat, and escape cove; benefits to migratory, threatened, or endangered species; and their ability to withstand inundation if planted at elevations below the top of the flood control pool.

Forested areas within the park would be avoided for placement of dredged material; however, several grassed areas within the park are being considered. Many of these areas are dominated by smooth brome but some also contain native prairie plant species. The areas with discharged dredged material would be graded to an appropriate slope and replanted with more desirable native prairie species such as big bluestem, little bluestem, Indian grass, switchgrass, sideoats grama, and western wheatgrass.

Fish rely upon healthy riparian areas in a variety of ways. Riparian trees and shrubs shade the shoreline, cooling water temperatures which allows for higher dissolved oxygen levels. Cool water and high levels of dissolved oxygen can be critical to fish. Riparian plants such as willows and cottonwoods also drop insects and leaves into the stream, providing food to the aquatic environment. Tree roots and branches also provide shelter for various aquatic species.

Under the no action alternative, shoreline erosion will continue along many parts of the lake, preventing a healthy riparian zone from developing.

4.10 Wetlands

Improving and adding littoral wetlands are an objective of this project. Littoral wetlands serve many purposes in a healthy lacustrine ecosystem. They help stabilize shorelines and the lakebeds in shallow water. Wetlands provide habitat and a food chain for young fish and help trap and utilize nutrients such as phosphorous, which can help reduce algal blooms. Ideally, littoral wetlands at Glenn Cunningham Lake would consist of a diverse mix of wetland plants (bulrushes, cattail, pondweeds, smartweeds, arrowheads, etc.) and not be characterized by a monoculture of reed canarygrass. The proposed project would enhance wetlands and increase wetland area by providing shoreline protection from wave action, managing water levels, improving submergent and emergent aquatic species, and reducing plant uprooting by less desirable fish.

Islands and wave breaks would reduce damaging wave action against shoreline vegetation and would prevent erosion on banks without riprap. Steep shorelines would be re-sloped and graded to reduce erosion and allow for reestablishment of hydrophytic (water-loving) vegetation. These actions would provide greater depth diversity along shorelines and islands. Different wetland plant species grow best within certain water depth ranges; therefore a variety of depths would produce a greater diversity of plants.

Wetlands would be improved by planting and nurturing selected species of plants using managed water levels. Drawing down the lake exposes a portion of the lake bottom to air, which solidifies and aerates the soil. This creates conditions conducive to vegetation growth either by volunteer vegetation, or by seeding. Once the vegetation is established, the lake is then slowly raised back to the normal pool elevation, flooding the newly established vegetation. Water level management can also be used to control invasive species such as reed canarygrass.

Increasing the diversity and quantity of submergent and emergent plants can improve water quality, as these plants reduce wave action and wind-caused turbidity and help cycle nutrients. They also tie up nutrients, which helps control algae blooms in nutrient rich waters. Besides

aiding water quality, fish food organisms live on or near aquatic plants. Some fish species, like bluegill, need aquatic plants for spawning. Underwater plants also provide cover for small fish to escape from predators.

Undesired fish species (i.e., carp and gizzard shad) that are presently abundant would be eliminated, decreasing the amount of foraging that causes uprooting of vegetation and turbulence in the water. Removing these fish will in turn increase hydrophytic plant establishment.

The no action alternative would result in the continued degradation of the present wetlands. Reed canarygrass would be expected to continue to be the dominant plant, forming monotypic stands in most areas. Wetland area may increase due to the constant growth of sediment deltas at the mouths of the Little Papillion Creek and tributaries, but these wetlands would be of poor quality and low diversity, consisting almost exclusively of reed canarygrass.

4.11 Wildlife

Wildlife requires several types of habitat to provide adequate food and protection. The area's wildlife communities are limited by the developing nature of the surrounding land, by the recreational uses of this site, and by the degraded nature of the aquatic habitat, due to watershed erosion, sedimentation, nutrient loading, and shoreline erosion. The construction of sediment structures, shoreline shaping and other activities would disturb portions of the existing upland habitat in the short term. However, habitat for aquatic wildlife would be improved with the restoration of the shoreline and offshore structures. Shoreline improvements would create more diverse wetlands which would improve habitat for many animals that use wetlands including amphibians, reptiles, birds, and mammals. More than one-third of the United States' threatened and endangered species live only in wetlands, and nearly half use wetlands at some point in their lives; many other animals and plants depend on wetlands for survival (USEPA 2006).

Terrestrial wildlife would not be affected directly by this project, although improved wetlands surrounding the reservoir would increase near-shore ecotype diversity. Grassy hillsides used for discharge of dredged material, that now contain a large amount of smooth brome, would be re-seeded with a diverse mix of native grasses. Wildlife would benefit with the improvement in diversity of native plant species.

The no action alternative would result in a continuing loss of open water habitat and the continued erosion of the shoreline. Although wetland area may increase due to the constant accumulation of sediment in the lake, it would most likely be dominated by a monoculture of reed canarygrass, which does not provide quality wildlife habitat.

4.12 Fish

Drawdown of the reservoir has already occurred, and as such, has removed the existing fish community. When refilled, the reservoir will be stocked with desirable sport fish, which may include walleye, bluegill, channel catfish, black crappie, and largemouth bass. Through the various structures (i.e., breakwaters, islands, sediment/nutrient traps) described in the preferred alternative, sediment and water quality problems associated with the current lake would be addressed, creating habitat better suited to desirable fish species.

When the reservoir basin dries, sediment will be removed with earth moving equipment in a fashion that will create ledges, trenches and drop-offs, creating irregularities in the reservoir's basin that will attract and concentrate fish. Sediment spoil can be used to rebuild shorelines and create islands. By removing silt from areas close to shore and depositing it at the existing bank, deep, fish supporting water can be created within casting distance of the bank. Sediment spoil excavated from the basin can be relocated in the basin as islands creating depth diversity, which is favored by desirable fish species such as large mouth bass, bluegill and black crappie. Offshore breakwaters would create quiet water near shore. These structures would allow aquatic vegetation to become established between the structures and the shore, creating productive fishing water (NGPC, 2006).

Water quality sediment traps would be installed at the upper reaches of the reservoir, trapping sediment and agricultural runoff as water enters the lake. Trapping sediment above the reservoir where it can be removed periodically keeps the water in the reservoir clearer than if sediment is allowed to accumulate in the basin or remain suspended. Anglers catch more fish from clear water, and more sport fish can be supported by a reservoir with clear water. Clear water produces more zooplankton than muddy water, increasing the food supply (NGPC 2006).

Currently, the reservoir lacks the beds of rooted aquatic vegetation, which serve as habitat for invertebrates and a variety of other wildlife and is vital to reproduction and survival of desired fish species. Removal of accumulated sediment, decreasing shoreline erosion by means of

breakwater structures, reducing sediment and nutrient load and removal of less desirable fish species will help in decreasing turbidity and improve lake water clarity. Water clarity affects the amount of vegetation a reservoir will support. Sunlight does not penetrate murky water, preventing growth of rooted aquatic plants. Aquatic plants provide refuge for young game fish and bait fish, feeding areas for predators and shade from summer sun. An additional value is that leaves and stems provide surfaces on which crustaceans, aquatic insects and other food organisms attach and grow and the plants' process of photosynthesis replenishes the water's vital oxygen supply (NGPC 2006).

Managing the water level within the reservoir would also promote establishment of aquatic plants. Periodic drawdown of the lake would expose a portion of the lakebed to the air and permit seeding and wetland maintenance. Maintaining and enhancing littoral wetlands aids in maintaining desired habitat for lake fishery.

The no action alternative would result in a continued decline in the quality of the fishery at Glenn Cunningham Lake due to the decline in reservoir volume, depth-diversity, water quality, loss of wetland diversity and the over abundance of less desirable fish.

4.13 Threatened and Endangered Species

An investigation for the presence of federally protected species, or suitable habitat was conducted, as well as investigation of the effects of the proposed action on federally-listed and candidate species as identified by the USFWS. The proposed action is not likely to adversely affect any of the listed threatened and endangered species that may occur in the project area as detailed in *Section 3.14*.

The no action alternative would have no impact on threatened or endangered species.

4.14 Cumulative Impacts

In compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) regulations, potential cumulative effects on the environment were assessed for the preferred alternative. Cumulative effect is the effect on the environment that results from the incremental impact of the action when added to other past, present and reasonably foreseen future actions. These effects can result from individually minor but collectively significant actions taking place over a period of time.

Prior to the construction of the Glenn Cunningham Lake, the area was generally described as gently rolling to hilly with well developed drainages. Land use was primarily under dryland cultivation and to a lesser extent, pastureland. Cultivated row crops were grown in the bottomlands and on the slopes above the creek. Corn, soybeans, and sorghum were the principle crops. Native plant communities were either greatly disturbed, dominated by herbaceous weedy species, or absent from the project lands. Existing plant communities consisted of abandoned fields, cultivated fields, pastures, hay meadows, farm home sites, woodlots which had been pastured or selectively cut, and ruderal vegetation along rights-of-way of roads, power lines, and pipelines. Riparian woodland was established along the creeks as these areas were not suitable for cropland (USACE 1976).

The Papillion Creek and Tributaries, Nebraska project was authorized by the Flood Control Act of 1968, Public Law 90-483. This flood control project consisted of a system of twenty-one dams and reservoirs, of which seven were constructed, including Site 11 (Glenn Cunningham Lake) (P-MRNRD 2005). The Glenn Cunningham Lake project was authorized to provide flood control, water quality, recreation, and fish and wildlife enhancement aspects in accordance with the Federal Water Project Recreation Act, Public Law 89.72. The reservoir opened to the public in 1977, providing a nearby and readily accessible area for land and water-based recreation to the urbanized population. The population around the reservoir area increased steadily due to the expansion and growth of the City of Omaha.

In 1986, the SPORT (Special Project for Omaha's Recreation of Tomorrow) was created, which provided special assistance in the watersheds of Cunningham, Standing Bear, Zorinsky, Wehrspann, and Candlewood Lakes from 1987 to 1993. This assistance helped to establish best management practices and reduce sedimentation to these lakes. At the conclusion of the program, erosion protection was accomplished on 73% of the land in the watersheds (PMRNRD, 2006).

Currently, the City of Omaha is growing rapidly with urban development already infringing on the extreme southeast edge of the watershed. City of Omaha planners expect this trend to continue and anticipate complete build out of the Papillion Creek watershed before 2050. As indicated in the 2005 Watershed Management Plan for Glenn Cunningham Lake, twelve percent (12%) of the watershed has been developed, primarily in two- to twenty-acre acreages. Twenty-nine

percent (29%) of the remaining watershed area is in grass or woodlands, including the Corps property (e.g., Fish and Wildlife Management areas) surrounding the reservoir. Fifty-five percent (55%) of the watershed is in a row crop rotation, and about four percent (4%) of the area is open water.

The majority of the Glenn Cunningham watershed is under agricultural production and as such soil erosion from agricultural land is the greatest contributor of sediment to the reservoir. Soil erosion has been a major problem in the watershed because of the steep slopes and highly erodible nature of the loess soils. In addition, the change from agricultural to urban land use provides flushes of sediment during construction periods. With the continual change from agriculture land use to urban development, there could be a potential shift in the primary sediment source (agriculture) to construction site runoff if sufficient controls are not in place. Nutrients such as phosphorus and nitrogen originate from agricultural activities, both row crop and animal operations, as well as urban stormwater runoff, and enter the lake through surface runoff either dissolved in the water or attached to soil particles. Post-development non-point source pollution is expected to be largely of nutrient and bacteria runoff from developed areas primarily from pet waste and lawn chemicals. In an agricultural watershed, a majority of bacterial filtration occurs in the riparian buffer areas. In an urban environment, pollutants are rapidly conveyed to a reservoir via streets and storm sewers. Often, nutrient loading from urban environments equals or exceeds that of agricultural lands, resulting in reservoir eutrophication (Olsson 2005).

Although this proposed project would have a positive impact by improving aquatic habitat and water quality, coordinated action is also being planned between government agencies, landowners, homeowners and other interested or concerned citizens or groups, to reduce sediment and nutrient loads and improve water quality in the Glenn Cunningham Lake through the application of soil and water conservation practices throughout the watershed. For instance, the Cunningham Lake Community-Based Watershed Management Plan is the culmination of a community-based watershed management planning process initiated by the City of Omaha and the Nebraska Department of Environmental Quality (NDEQ) for Glenn Cunningham Lake (Cunningham Lake) to begin a planning effort to identify ways to improve and protect the reservoir during watershed development. Watershed partnerships formed through a community-based watershed planning process can provide a forum for constructive negotiation and mediation, and promote opportunities for balancing environmental concerns with the

economic growth. The community-based process provides a unique platform for uniting watershed landowners, reservoir users, concerned citizens and public agencies in development of a vision and goals for the lake and watershed. Multiple public agencies have committed themselves to the development and implementation of measures that will enhance existing water quality and protect the reservoir from future degradation due to development in the watershed. The development of a community-based watershed management plan for the reservoir is one of the cornerstones in that effort. In addition, development proposals within the City of Omaha's zoning jurisdiction that are also reviewed by the Subdivision Review Committee should ensure that adequate measures to control wind and water erosion are incorporated in construction plans.

With the continuing development of the watershed, the preferred alternative will provide measures to improve water quality in the lake, such as the on-site upstream sediment basins being periodically cleaned out before sediment and nutrients reach the main body of the lake. Although community-based watershed management plans could be implemented with either alternative as measures to decrease sedimentation into the reservoir, the no action alternative would not provide the structural measures to reduce erosion and decrease the rate of sedimentation as proposed under the preferred alternative.

SECTION 5.0 PUBLIC AND AGENCY INVOLVEMENT

5.1 Agency Coordination

A scoping letter dated March 20, 2006 was sent to agencies and concerned parties requesting comments on the proposed restoration action. Responses received from the agencies are summarized below. Copies of the response letters are included in ***Appendix C***.

United States Army Corps of Engineers

1. "*Wetland Determination/Delineation. Wetland determinations/delineations must be completed… so that impacts to wetlands can be evaluated. The determination/delineation should include the area of normal pool elevation*;"

A wetland determination was conducted in June of 2006. Wetlands were found occurring as lacustrine fringe along segments of the shoreline of the lake, and as larger palustrine areas in the coves of the lake. These wetlands were generally of low quality and dominated by reed canarygrass.

2. "*Unavoidable Impacts. Primary impacts to Waters of the United States will be calculated by the amount of fill placed within the wetlands and/or waters of the Unites States. Secondary impacts will include any impact that is closely related to water quality, such as, but are not limited to, wetlands that will be flooded in the permanent pool, associated trees removed to build the structure, riparian corridor habitat, and any other upstream or downstream impact*;"

While there would be some short-term impacts to downstream water quality, these are an unavoidable product of implementation of this project. Measures would be taken to minimize these impacts throughout the rehabilitation process and implementation of Best Management Practices (BMP's). The long-term impacts to Waters of the United States would be beneficial and outweigh the negative short-term impacts.

3. "*Nationwide Permit #27 v. Individual Permit. Nationwide Permit 27 may apply to the Cunningham Lake Rehabilitation project. It should be noted that in order to receive a nationwide verification, the project must first pass regional conditions specific to Nebraska. If the structure does not qualify for the Nationwide 27, and is located on a perennial stream, it will be evaluated as an Individual permit*;"

Impacts to wetlands are currently being evaluated. The project would be permitted by the most effective and expeditious method possible when impacts are finalized. We believe that this project may qualify for a Nebraska General Permit 98-05 for Lake Rehabilitation.

4. "*Mitigation. Provided the project is deemed permitable, unavoidable impacts to wetlands and streams that occur due to the construction of the structure may require mitigation to replace the wetland and stream area that was impacted*;"

If mitigation is necessary, impacts to wetlands and streams would be mitigated by the nature of the rehabilitation project. The project would create wetland area consistent with the Omaha District Corps guidelines required for mitigation. The project would not decrease stream length, and would therefore, not require stream mitigation.

5. "*Buffer Strips. An appropriate-sized buffer strip shall be required around any wetland or channel mitigation. At a minimum, the buffer will be 50 feet (1:1 slope) in width around the normal pool, wetland, or each side of a channel. Sloped buffers require additional width*."

If necessary, grass buffers would be planted around wetland areas consistent with the Omaha District Corps guidelines. Additionally, the entire Corps property would act as a buffer surrounding the lake.

Nebraska Department of Environmental Quality

> "…The implementation phase(s) of the project might cause temporary water quality issues…but NDEQ also understands that this is sometimes a normal part of working with the aquatic environment. We believe that as the project progresses, the projects sponsors' complying with any stormwater construction permit (NPDES) and any CWA Section 404 permit application requirements will provide NDEQ with our usual opportunities to review plan details and have regulatory oversight of water quality impacts."

While there would be some short-term impacts to downstream water quality, these are an unavoidable product of implementation of this project. Measures would be taken to minimize these impacts throughout the rehabilitation process and implementation of Best Management Practices (BMP's). The long-term impacts to Waters of the United States would be beneficial and outweigh the negative short-term impacts. The project sponsors would comply with storm water construction permits (NPDES) and (CWA) Section 404 permit application requirements.

Nebraska State Historical Society

> "*There is…the possibility that previously unsuspected archaeological remains may be uncovered during the process of project construction*."

The University of Nebraska-Lincoln, Department of Anthropology, Division of Cultural Resource Management conducted an archeological resource inventory and impact assessment of the

Areas of Potential Effect (APE) of the proposed rehabilitation project. The report determined that no cultural or historic resources are located on the project site. In the event that artifacts are found during construction, they would be reported to the Nebraska State Historical Society and appropriate actions would be taken.

Threatened or Endangered Species

The U.S. Fish and Wildlife Service expressed concern for threatened or endangered species, alteration and impact of the surrounding environment, and addressing concerns of the public. Some of the surrounding land is already established for mitigation of the original construction of the reservoir. These areas would be avoided during restoration efforts. An investigation into the possibility of occurrence of bald eagle and western prairie fringed orchid was conducted. No threatened or endangered species were seen on site; however a few tall, dead cottonwood trees, which could be used as roosting sites for the bald eagle, were seen in the southern portion of the site, just east of the dam. No other suitable nesting sites for the eagle or habitat for the orchid were found within the project area.

5.2 Public Involvement

A public meeting/open house was held to provide information on the planned Glenn Cunningham Lake drawdown and restoration project. The meeting was held at the Benson Park Pavilion, 7028 Military Avenue on Wednesday, March 29, 2006 from 5:00 to 7:00 p.m. Public Notices were advertised in the Omaha World Herald for several weeks prior to the meeting. In addition, an informational article was published in the Outdoors Section of the newspaper. Those who attended were provided an opportunity to have questions answered and express any concerns they may have had in regards to the drawdown and restoration project. There were no objections to the drawdown and the overwhelming majority felt that the project was a good investment for the future of the reservoir. There were several requests that the drawdown, restoration project, and refill be completed as soon as possible so as not to draw out the process any longer than needed.

Questions and comments by the public and concerned organizations were addressed and are included in ***Appendix C***.

SECTION 6.0 REFERENCES

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SECTION 7.0 LIST OF PREPARERS

Jason Farnsworth – Project Manager

Craig Mielke, PWS - Project Scientist

Ruth Bentzinger - Associate Scientist

David McKenzie - Assistant Environmental Scientist

APPENDIX A

Typical Outlet Modification and Enhancement Structure Details

APPENDIX B

Wetland Delineation

APPENDIX C

Agency Response Letters
Public Involvement Comments